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Unique interplay between superconducting and ferromagnetic orders in EuRbFe4As4

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Abstract

© 2018 American Physical Society. Transport, magnetic, and optical investigations on EuRbFe4As4 single crystals evidence that the ferromagnetic ordering of the Eu2+ magnetic moments at Tm=15 K, below the superconducting transition (Tc=36 K), affects superconductivity in a weak but intriguing way. Upon cooling below Tm, the zero resistance state is preserved and the diamagnetic response is only slightly affected by the emerging ferromagnetism; a perfect diamagnetism is recovered at low temperatures. The infrared conductivity is strongly suppressed in the far-infrared region below Tc, associated with the opening of a complete superconducting gap at 2Δ=10 meV. A gap smaller than the weak-coupling limit suggests strong orbital effects or, within a multiband superconductivity scenario, the existence of a larger yet unrevealed gap.

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